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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/970,066	11/13/1997	PRADEEP K. DHAL	C-8232	2141

20349 7590 10/09/2003

POLAROID CORPORATION
PATENT DEPARTMENT
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EXAMINER

ANGEBRANNDT, MARTIN J

ART UNIT	PAPER NUMBER
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1756

26

DATE MAILED: 10/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/970,066

Applicant(s)

DHAL ET AL.

Examiner

Martin J Angebranndt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 28-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 28-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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1a The response provided by the applicant has been read and given careful consideration.

The changes to the formula found on page 14, claim 30, claim 34, claim 35 and claim 38 are held to be minor and are clearly corrections to typographical errors in the formulae or text.

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 28-40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The specification and claims contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The limitation of p to 3 or more in formula (IV) does not have a basis in the specification as originally filed. This formula appears on page 7 and the applicant relies upon the disclosure with respect to a different formula (II) within a different paragraph on page 6 at line 22-23 for support. The disclosure in US 5,523,374 A in column 7 points more to p being 6-11.

The applicant is free to exclude free radical based polymerization (specification on page 1 at lines 9-10) or the use consisting of language, but otherwise attempting to exclude other undisclosed mode of polymerization using the language "...capable of forming a volume hologram solely by cationic polymerization...." Does not seem to be supported by the specification.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watt CA 995843.

Watt CA 995843 teaches in example 18 (page 33) a composition including a prepolymer of a diglycidyl ether of bisphenol A, Epoxy phenol novolak (polyfunctional epoxide 4/20-21), (3,4- epoxycyclohexyl) methyl- 3,4- epoxycyclohexane carboxylate, and allyl glycidyl ether mixed with p-chlorobenzenediazonium hexafluorophosphate to render it light sensitive. The addition of poly vinyl pyrrolidone is disclosed as inhibiting the premature gelation of the epoxy compositions (page 38/lines 22+)

It would have been obvious to one skilled in the art to add poly vinyl pyrrolidone to the composition of example 18 to inhibiting the premature gelation of the epoxy composition.

The applicant points out that a monofunctional epoxide is present in the cited example, but that a binder is not. The applicant argues that the polyvinyl pyrrolidinone, while a polymer is not inert and reacts with the monomer. The examiner notes that the claims do not exclude monofunctional epoxides. The examiner also points out that as a VINYL based polymer, the mechanism for polymerization is free radical, not cationic. Further, the examiner notes that the polymer has already been formed and assumably the reaction has gone to completion. The cationic curing reaction does seems to proceed in the reaction of example 25, so the lack of interference required by the claims seems to be met. As the claims do not exclude monofunctional epoxide monomers, the use of polyvinyl pyrrolidinone as the binder and the evidence does not describe any unobvious benefits to the binder. The examiner holds that the

refractive index is different from that of the monomers in their cured or uncured state as they are different chemicals. The rejection stands.

5. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watt CA 995843.

Watt CA 995843 teaches in example 3 (col. 10) a composition including a epoxide of bisphenol A and Epoxy cresol novolak (polyfunctional epoxide 4/20-21) mixed with stilbene cyclopentadienyl iron tosylate to render it light sensitive. The addition of a binder is disclosed as rendering the composition aqueous developable. (5/64-6/2)

It would have been obvious to one skilled in the art to add a binder to the composition of example 3 to render the composition aqueous developable

The examiner separated this rejection from that above as example 3 does not apply to claim 30. The response provided above is relied upon without further comment.

6. Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. '846, in view of Keys et al. '567 and Cornforth et al. '016.

Sato et al. '846 teaches useful cationic polymerizable compounds (3/5-4/4) The use of compounds having a siloxane group increases, refractive index modulation. This includes compounds embraced by formula (I). The use of multiple epoxides is disclosed (3/45-48) Example 2 uses a cationically polymerizable siloxane compound, a free radically polymerizable compound, photoinitiators for each and a polymeric binder. (table 2, columns 9-10). The structure of the silicon containing cationically polymerable materials is disclosed in column 21 and is identical to the formula in claims 3. The recording of the interference fringe by cationic polymerization is disclosed. (5/36-41). The use of various binders including polyvinyl pyrrolidone is disclosed. (7/15-22).

Keys et al. '567 teach that when more crosslinking is desired, the use of multi functional monomers in amounts up to 5% is a means to achieve this.

Cornforth et al. '016 teaches the use of mono, di and polyfunctional monomers in radiation curable compositions. The high functionality monomers are disclosed as giving rapid cure speeds, and high crosslinking density which results in films having good chemical resistance and hardness, but poor adhesion. (1/65-2/12).

It would have been obvious to one skilled in the art to add other, multi functional epoxy monomers/oligomers, such as those disclosed by Sato et al. '846, to the composition of example 1 of Sato et al. '846 and use them in forming a hologram based upon the direction to use more than one and that any cationically polymerizable compound(s) would be useful in the composition within Sato et al. '846 and the direction to the addition of polyfunctional monomers when increased crosslinking is desired in the holographic art by Keys et al. '567 and Cornforth et al. '016 and increases the curing speed as disclosed by Cornforth et al. '016.

The claims require that the composition be able to form a volume hologram solely by cationic polymerization. The examiner points to column 5 at lines 36-41 which describe the recording of the fringes using the cationically polymerizable monomers and takes this to indicate that the hologram can be formed solely by cationic polymerization. The applicant may wish to include a recitation specifically excluding free-radically polymerizable materials based upon the disclosure on page 1 of the instant specification to obviate this rejection. The applicant has filed an affidavit, sworn out by David Waldman (inventor). The examiner has examined the data, particularly that of figures 1, 2 and 4. The examiner determined that to achieve a diffraction intensity of 400 microwatts, type I required an exposure of 42.78 (sec \cdot mW/cm²), type II required an exposure of 23.97 (sec \cdot mW/cm²) and type III required an exposure of 20.46 (sec \cdot mW/cm²) which supports the trend in the balance of the affidavit without the possible error due to the differences in the dynamic range of the media or the exact location of the shoulder (see James, "The Theory of the Photographic Process", pp. 501-510 (1977) particularly analogous to figure 17.36.). The applicant is correct in asserting that the addition of higher functionality

monomers results in increased sensitivity/speed in the composition. This is appreciated in the radiation curing arts as evidenced by Cornforth et al. '016 and therefore cannot be considered unobvious to one of ordinary skill in the art.

The applicant argues that Sato et al. requires a flood exposure to complete curing. The examiner points out that the interferometric exposure forms the hologram and that the flood exposure merely renders the hologram stable to light, therefore the disclosure of Sato et al. as a total indicates to one skilled in the art that the holographic image can be formed using only cationic polymerization. The examiner notes that the applicant may wish to include a recitation specifically excluding free-radically polymerizable materials based upon the disclosure on page 1 of the instant specification to obviate this rejection. The examiner particularly points out that the claims are not limited to a process.

The applicant argues that the Keys et al. describes only the use of free radically polymerizable materials. This is correct, but ignores that these are all radiation curable materials and that the ability to crosslink and their reactivity would be related to the number of reactive polymerization sites on these monomers. The examiner is not asserting that the reactivities for free radically polymerizable materials and cationically curable materials are the same, but that within each of these monomer groups one of ordinary skill in the art would expect the more reactive/polymerization sites per molecule, the higher the crosslinking and higher the speed. Irrespective of the type of polymerization, the photoinitiator is excited by absorption of the photon(s) and catalyzes the polymerization reaction. Therefore the teachings of Keys et al. '567 and Cornforth et al. '016 are relevant.

7. Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016.

Dhal et al. WO/97/1318 teaches the use of compositions including at least one monomer or oligomer capable of undergoing cationic photopolymerization. The use of any monomer

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capable of undergoing cationic polymerization is disclosed on pages 6 and 7. Useful photosensitizers and photoinitiators are disclosed on pages 5 and 7. Useful binders are disclosed on page 4.

Ohe et al. '345 teaches the use of cationically polymerizable materials which result in improved diffraction efficiency and superior environmental properties. Useful epoxides include those disclosed in columns 12-15 including mono, di and polyfunctional monomers.

It would have been obvious to one skilled in the art to add other, multi functional epoxy monomers/oligomers, such as those disclosed by Ohe et al. '345, to the composition of Dhal et al. WO/97/1318 and use them in forming a hologram based upon the direction to use more than one and that any cationically polymerizable compound(s) would be useful in the composition within the Dhal et al. WO/97/1318 reference, their previous use within the holographic art by Ohe et al. '345 and the direction to the addition of polyfunctional monomers when increased crosslinking is desired in the holographic art by Keys et al. '567 and Cornforth et al. '016 and increases the curing speed as disclosed by Cornforth et al. '016.

The applicant argues that the combination of the references does not show the benefit discovered by the applicants, in that minimal shrinkage occurs when difunctional and polyfunctional monomers are used. The applicant agrees that using tri or higher functional monomers will rigidify the resulting polymeric structure and that this is well known in polymer technology. The applicant argues that this teaching has nothing to do with the benefits achieved by or problems solved by the applicants. The examiner disagrees, noting that increased crosslinking and the resultant increase in rigidity due to it would be expected to reduce shrinkage as *the more rigid structure would be more resistant to forces acting upon it*. This would be appreciated for polyfunctional monomers irrespective of the mechanism by which the crosslinking occurs. The increased rigidity and reduced shrinkage due to that rigidity would be expected with increased crosslinking for both cationic and free radical polymerization systems

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and this position is supported by Cornforth et al. '016. Direction to use increased crosslinking within the art is shown by Keys et al. '567 and as similar enhancement processes are used, would be expected to achieve similar benefits. Additionally, increased refractive index modulation and resistance to abrasion and/or swelling (causing drift of replay wavelength) could reasonably be expected by one skilled in the art.

The applicant is incorrect in asserting that the Ohe et al. reference only forms a latent image. After the holographic exposure, the hologram is immediately readable due to the variation in the refractive indices caused by the selective curing in correspondence to the interference fringes, although the flood exposure does make it more stable. In photographic film, the silver halide requires development because the effect of the (minimum of four) photons cannot change the silver halide crystal to silver metal without amplification. In photopolymerizable systems (see Haugh '526 column 9/lines 33-71), the interferometric image is immediately readable after formation and does not require any amplification. See also example XXXVI in Haugh '526, where the hologram is viewed during formation. The curing exposure does not make the hologram.

8. Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, Cornforth et al. '016 and Sato et al. '846

In addition to the basis provided above, the examiner holds that it would have been obvious to use other siloxane compounds known to be useful cationically polymerizable materials, such as those disclosed by Sato et al. '846, in place of those specifically used in the examples of Dhal et al. WO/97/1318 as modified by Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016 with a reasonable expectation of achieving comparable results and that any cationically polymerizable compound(s) would be useful in the composition within the Dhal et al. WO/97/1318 reference.

The examiner relies upon the response above without further comment.

9. Claims 28-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, Cornforth et al. '016 and Crivallo et al. J. Polymer Sci. and/or Eckberg et al. EP 0391162.

Crivallo et al. J. Polymer Sci., Vol. 28A pp. 479-503 teaches the use of various epoxy silane compounds including those shown in tables I and II. Useful properties appear in pp 501-503

Eckberg et al. EP 0391162 teaches the use of cationically curable compounds embraced by the formula shown in the abstract and on page 5 with cationic photoinitiators.

In addition to the basis provided above, the examiner holds that it would have been obvious to use other siloxane compounds known to be useful cationically polymerizable materials, such as those disclosed by Crivallo et al. J. Polymer Sci. and/or Eckberg et al. EP 0391162, in place of those specifically used in the examples of Dhal et al. WO/97/1318 as modified by Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016 with a reasonable expectation of achieving comparable results and that any cationically polymerizable compound(s) would be useful in the composition within the Dhal et al. WO/97/1318 reference.

The examiner relies upon the response above without further comment.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Curatolo '301 cites 5,418,016 (2/47-58) in asserting that it is generally accepted that high functional monomers give high cure speeds and crosslinking density.

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Curatolo '301 cites 5,418,016 (2/47-58) in asserting that it is generally accepted that high functional monomers give high cure speeds and crosslinking density.

Colvin et al. '187 teaches preferential curing of polyfunctional monomers/oligomers (1/48-63 and 2/4-12) and the use of higher functionality monomers/oligomers is disclosed as increasing crosslinking density 4/59-65).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Angebrannndt whose telephone number is (703) 308-4397.

I am normally available between 7:30 AM and 5:00 PM, Monday through Thursday and 7:30 AM and 4:00 PM on alternate Fridays.

If repeated attempts to reach me are unsuccessful, my supervisor may be reached at (703) 308-2464.

Facsimile correspondence should be directed to (703) 872-9310 for before final amendments or (703) 872-9311 for after final communications.

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Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

A handwritten signature in black ink, appearing to read 'M. Angebranndt', written over the printed name.

Martin J. Angebranndt
Primary Examiner, Group 1750
October 7, 2003